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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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08/995,108 12/19/97 DING

P AM-1776

EXAMINER

IM22/0706

MERCADO, J

PATENT COUNSEL
APPLIED MATERIWLS INC
PO BOX 450-A
SANTA CLARA CA 95052

ART UNIT

PAPER NUMBER

1745

DATE MAILED:

07/06/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

File copy

Advisory Action

Application No.
08/995,108

Applicant(s)
Ding et al.

Examiner
Julian A Mercado

Group Art Unit
1745



THE PERIOD FOR RESPONSE: [check only a) or b)]

- a) ☐ expires _____ months from the mailing date of the final rejection.
- b) ☒ expires either three months from the mailing date of the final rejection, or on the mailing date of this Advisory Action, whichever is later. In no event, however, will the statutory period for the response expire later than six months from the date of the final rejection.

Any extension of time must be obtained by filing a petition under 37 CFR 1.136(a), the proposed response and the appropriate fee. The date on which the response, the petition, and the fee have been filed is the date of the response and also the date for the purposes of determining the period of extension and the corresponding amount of the fee. Any extension fee pursuant to 37 CFR 1.17 will be calculated from the date of the originally set shortened statutory period for response or as set forth in b) above.

- ☐ Appellant's Brief is due two months from the date of the Notice of Appeal filed on _____ (or within any period for response set forth above, whichever is later). See 37 CFR 1.191(d) and 37 CFR 1.192(a).

Applicant's response to the final rejection, filed on Jun 14, 2000 has been considered with the following effect, but is NOT deemed to place the application in condition for allowance:

☒ The proposed amendment(s):

- ☒ will be entered upon filing of a Notice of Appeal and an Appeal Brief.

☐ will not be entered because:

- ☐ they raise new issues that would require further consideration and/or search. (See note below).
- ☐ they raise the issue of new matter. (See note below).
- ☐ they are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal.
- ☐ they present additional claims without cancelling a corresponding number of finally rejected claims.

NOTE: _____

- ☐ Applicant's response has overcome the following rejection(s): _____

- ☐ Newly proposed or amended claims _____ would be allowable if submitted in a separate, timely filed amendment cancelling the non-allowable claims.

- ☐ The affidavit, exhibit or request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____

- ☐ The affidavit or exhibit will NOT be considered because it is not directed SOLELY to issues which were newly raised by the Examiner in the final rejection.

- ☒ For purposes of Appeal, the status of the claims is as follows (see attached written explanation, if any):

Claims allowed: _____

Claims objected to: _____

Claims rejected: 8-27

- ☐ The proposed drawing correction filed on _____ ☐ has ☐ has not been approved by the Examiner.

- ☐ Note the attached Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

- ☒ Other See attached.

Maria Nuzzolillo
Supervisory Patent Examiner
Technical Center 1700

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DETAILED ACTION

1. The amendment to the claim 12 will be entered upon filing a Notice of Appeal and an Appeal Brief. It is noted that claim 27, submitted as being twice amended, appears to be exactly identical as previously once amended.

Arguments against Gelatos in allegedly teaching away from the claimed invention are not persuasive. With respect to employing Ta as part of the barrier layer, Gelatos as cited in the previous Office Action specifically teaches or at least suggests the use of Ta as part of a barrier layer structure. (Col. 3 line 56 *et seq*) Applicant's additional arguments against Gelatos are considered to be outside the scope of the present claims, e.g. advantages of the disclosed lower temperature range and electromigrational characteristics of copper. Gelatos is resubmitted to teach the instant temperature range, and specifically teaches this temperature range to be conventional. (Col. 5 line 39) Landers was relied upon solely to show that Ta/TaN and Ti/TiN barrier layer structures are obvious variants of one another. Gelatos clearly teaches that for a barrier layer structure, the order of deposition is the nitrided metal, followed by the metal itself, then the copper wiring layer. Gelatos as discussed above clearly suggests the use of Ta as part of the barrier layer, while Landers clearly teaches that Ta and Ti-based metals are art-recognized equivalents. Thus, substituting a Ta and its corresponding nitride, i.e. TaN in Gelatos' invention would have been obvious to one of ordinary skill in the art for reasons such as forming a barrier layer with known and accepted barrier layer performance.

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Hoshino is resubmitted to teach a Ta layer followed by the deposition of a Cu layer. A modification of Hoshino by employing an underlying TaN layer would have been obvious to one of ordinary skill in the art in view of Landers' teaching that Ta/TaN and Ti/TiN barrier layer combinations are well-known and desired for lining of a subsequent metallization layer. Hoshino teaches the instant thickness of the Ta layer, thus, it is reasonably presumed that the crystallographic properties of the Cu layer would be as claimed since this property is disclosed to be dependent on the Ta thickness.

Ngan was relied upon solely to show that ion deposition sputtering is desired for reasons such as more uniform step coverage and filling of contact hole vias. Ngan in combination with the above teachings of Gelatos, Hoshino and Landers clearly teach or at least suggest the instant invention for the reasons discussed above.

Conclusion

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Julian A. Mercado whose telephone number is (703) 305-0511 . The examiner can normally be reached on Monday through Thursday from 8:30 AM to 6:00 PM. The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Maria Nuzzolillo, can be reached on (703) 305-3776. The official fax phone number

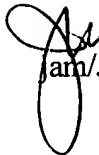
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for the organization where this application or proceeding is assigned is (703) 305-3599. The unofficial fax number is (703) 306-3429.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.

 Jan/July 5, 2000